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system is interesting because of its long period and large (projected) semi-major axis.

The elements are as follows:—

$V = 1375.3$ days
$T =$ J. D. 2416035
$v = -18.8^{\text{km}}$ per second
$e = 0.44$
$\omega = 124^\circ.0$
$K = 22.2^{\text{km}}$ per second
$a \sin i = 377{,}000{,}000^{\text{km}}$

PAUL W. MERRILL.

MT. HAMILTON, CAL.

DOUBLE-STAR NOTES.

Misure di Stelle dopie . . . negli anni 1886-1900 da G. V. SCHIAPARELLI.[1]—The most important recent contribution to the literature of double-star astronomy is the second volume of SCHIAPARELLI'S double-star measures, containing the results of 7,177 measures of 636 systems made with the 18-inch[2] Merz-Repsold refractor of the Milan Observatory in the fifteen years 1886-1900. The earlier volume, of which the author modestly says this is a continuation, was published in 1888, and contained 3,781 measures of 465 systems, the fruit of eleven years' work (1875-1885) with the 8-inch Merz refractor of the same observatory. This simple statement is sufficient to show that few astronomers have made larger contributions to this department of the science, and examination of the new volume will convince anyone that size is in this case a correct indication of value. The observing list was prepared with care, including mainly the more important double stars in the Dorpat and Pulkova catalogues (Σ and OΣ stars), with shorter lists from the discoveries of BURNHAM and HOUGH and a few miscellaneous pairs. Every precaution was taken to avoid or minimize the systematic and accidental errors of observation. In all cases in which the stars were known to be in orbital motion, the measures were repeated year after year, in some cases for the whole quarter-century. For many of the most interesting binaries we have therefore an almost continuous record of the motion for this length of time in the work of a single observer. Such measures are the most valuable of contributions to the study of double-star astronomy.

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[1] The death of this great astronomer on July 4, 1910, is reported in the newspapers.

[2] The Milan refractor is usually referred to as an 18-inch telescope; but the unit is the French inch. In English inches the aperture is 19.17 (= 487mm).

The brief introduction to the volume gives an interesting description of the great Milan equatorial, the location, mounting, object-glass, and micrometer, the conditions under which the measures were made, the observing methods followed, and the arrangement adopted in publication. That the telescope is an excellent one, and that the atmospheric conditions at Milan are good, is amply shown, as SCHIAPARELLI hopes it may be, by the measures in this volume. Important as these two items are, however, they only afford the medium through which the skillful observer works, and they acquire their value only through being used by him.

SCHIAPARELLI remarks that his experience in the study of *Mars* "has demonstrated in the most incontestible manner that even in the midst of a great city one has intervals of quiet atmosphere, such as permit the most exquisite definition and, when there is sufficient light, the most perfect images." It is of interest, too, to read that his experience proved to him that no noticeable improvement was effected by cutting down the aperture by diaphragms of different sizes. "Therefore," he says, "in all of my observations I have always used the full aperture."

Observations of Southern Double Stars.—Under this heading Mr. R. T. A. INNES publishes in Transvaal Observatory Circular No. 1 a list of 268 new double stars discovered with the 9-inch Grubb refractor at Johannesburg. A second table is also included in the circular, containing notes, estimates of position-angles and distances, etc., of known double stars which are in motion or which are misidentified in published catalogues.

The new double stars are numbered in continuation of those published by the same observer in the *Monthly Notices, R. A. S.*, for December, 1903, and bring the total of his discoveries to 700. Only five of the new pairs have distances estimated to exceed 5″, and 74 are estimated to fall within the limit of 2″. Unfortunately, the 9-inch telescope is not yet provided with a micrometer, so that both angles and distances had to be estimated.

In his introduction Mr. INNES says that the search for new pairs has been confined to the sky area south of — 19° declination, and that only stars "easily seen in the 2-inch finder undergo scrutiny in the 9-inch, and it is believed that this limits the examination to stars of the 8.8 magnitude or brighter." The present writer hopes that Mr. INNES may later decide to extend his survey to include stars of 9.0 magnitude and to take such precautions as will enable him to state definitely that he has examined all stars to a given magnitude in a given region of the sky. My experience in similar work in the northern sky leads me to believe that this can only be done by preparing charts in advance, which shall contain all of the stars to be examined. With all possible care on the observer's part, it is still practically inevitable that some stars brighter than the limits set will escape examination unless such a plan is followed. The charts have the further advantages that they serve as a record of the work done, enable the observer to say on what date and under what conditions a given star was examined, make the identification of any double star easy and certain, not only at the time of first examination but whenever it is desired to remeasure it, and, most important of all, furnish accurate data for statistical studies.

Mr. INNES is at present the only observer in the southern hemisphere who is engaged in double-star work, and everyone who is interested in this department of astronomy will wish him continued success. It is a pleasure to be able to say that his instrumental equipment is soon to be greatly increased.

Micrometric Measures of Double Stars, by PHILIP FOX.—It will be recalled that Professor PHILIP FOX, of the Yerkes Observatory, last year succeeded to the directorship of the Dearborn Observatory. It is gratifying to find that Mr. FOX intends to devote at least a portion of his time with the 18½-inch refractor to the continuation of double-star measures. The paper noted above appears in No. 611 of the *Astronomical Journal*, and contains measures made with the 12- and 40-inch refractors of the Yerkes Observatory, as well as some with the Dearborn telescope.

Sutton Double-Star Observations. — Under this title the veteran observer, Dr. W. Doberck, publishes in *Astronomische Nachrichten,* Nos. 4394-95, a continuation of his long series of double-star measures. Dr. Doberck is also continuing his investigations of orbits, as appears from two papers published in *Astronomische Nachrichten,* No. 4400, entitled "Synopsis of Elements of Orbits of Some Double Stars," and "On the Orbit of 40 o^2 *Eridani.*" It is to be hoped that Dr. Doberck will soon publish in collected form the results of his extensive investigations in this field.

Among other recent papers of interest to double-star observers we note the publication in *Astronomische Nachrichten,* No. 4406, of a list of eighty-two new double stars by M. Robert Jonckheere, of the observatory at Hem, France. The stars for the most part, are fainter than 9.0 B. D. magnitude, though several of the later discoveries are brighter than this. It is a satisfaction to note that M. Jonckheere has apparently set himself rigorous limits in defining a double star. With one exception, the measured distances are less than 4″, and more than half are less than 2″.

Attention should also be called to a very interesting theoretical paper by Mr. H. C. Plummer, entitled "On the Analytical Method of Finding the Orbit of a Double Star," which is published in the *Observatory* for May, 1910. In this paper Mr. Plummer derives relations between the coefficients of the equation of the apparent ellipse and the geometrical elements of the true orbit, which are, in effect, equivalent to those employed in the well-known Kowalsky method, though by no means identical. Mr. Plummer notes that his method has "points of contact with known graphical methods," and, incidentally, directs attention to a convenient and accurate graphical method published by him in Volume LX (page 483) of the *Monthly Notices, R. A. S.*

R. G. Aitken.

June 14, 1910.

Note on the Double Star OΣ 251.

The double star OΣ 251 was examined with the 36-inch telescope on the night of June 2, 1909, and found to be a close, unequal pair. No further measures were obtained until recently,